

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Patent Application of

MOTTERLINI et al.

Atty. Ref.: 620-370

Serial No. 10/535,226

Group: 1614

Filed: May 17, 2005

Examiner: Unknown

For: THERAPEUTIC DELIVERY OF CARBON MONOXIDE

\* \* \* \* \*

Commissioner for Patents  
P.O. Box 1450  
Alexandria, VA 22313-1450

May 17, 2006

Sir:

**INFORMATION DISCLOSURE STATEMENT**

- ☒ 1. **PTO-1449 Pursuant to 37 CFR 1.97(b)**  
[within 3 months of filing or prior to 1st Office Action on the merits]  
N/C
- ☐ 2.(a) **Statement Pursuant to 37 CFR 1.97(c)**  
[before Final Office Action or Allowance (requires Rule 97(e)  
Statement or Rule 17(p) fee)]  
N/C
- ☐ 2.(b) **Fee Payment Pursuant to 37 CFR 1.97(c)**  
[before Final Office Action or Allowance (requires Rule 97(e)  
Statement or Rule 17(p) fee)]  
\$180.00
- ☐ 3. **Pursuant to 37 CFR 1.97(d)**  
[after Final Office Action or Allowance (requires Rule 97(e)  
Statement and Rule 17(p) fee), but before final fee payment]  
\$180.00

The following are submitted in the above-identified application in compliance with  
37 C.F.R. §§ 1.97 and 1.98:

- ☒ 4. A list of documents on Form PTO-1449 together with copies of each identified document and a translation or a concise explanation of each non-English language document (such as a Search Report) is enclosed herewith.

This paper is submitted in accordance with:

- ☒ 5. 37 CFR 1.97(b): [within 3 months of filing or prior to 1st Office Action]
- ☐ 6. 37 CFR 1.97(c): [before Final Office Action or Allowance, whichever is earlier];  
and
- ☐ a) The required Statement made in item 8 below; or
- ☐ b) The \$180.00 fee specified in 37 CFR §1.17(p) for submission of this Information Disclosure Statement is authorized in item 9 below.
- ☐ 7. 37 CFR §1.97(d): [after Final Office Action or Allowance (requires Rule 97(e) Statement and Rule 17(p) fee), but before final fee payment]; and
- ☐ a) The fee (\$180.00) required by 37 CFR §1.17(p) is submitted herewith;  
and
- ☐ b) The required Statement is stated in item 8 below.
- ☐ 8. Statement under 37 CFR 1.97(e)
- ☐ a) The undersigned attorney of record hereby certifies under 37 C.F.R. §1.97(e) that each item of information contained in this Information Disclosure Statement was first cited in a communication from a foreign patent office in a counterpart foreign application not more than three months prior to the filing of this Information Disclosure Statement (each item contained in this IDS was the first citation of that item by a foreign patent office in a counterpart foreign application which occurred no more than three months prior to the filing of this IDS); or
- ☐ b) No item of information contained in this Information Disclosure Statement was cited in a communication from a foreign patent office in a counterpart foreign application, and, to the knowledge of the person signing this Statement, after making reasonable inquiry, no item of information contained in this Statement was known to any individual designated in 37 CFR §1.56(c) more than three months prior to the filing of this Information Disclosure Statement.

- ☒ 9. Please charge all deficiency fees associated with the submission of this Information Disclosure Statement and any other fees applicable to this application to Deposit Account No. 14-1140. An original and one (1) copy of this document are enclosed.

Respectfully submitted,  
NIXON & VANDERHYE P.C.

By:                     /B. J. Sadoff/                      
B. J. Sadoff  
Reg. No. 36,663

901 North Glebe Road, 11th Floor  
Arlington, VA 22203-1808  
Telephone: (703) 816-4000  
Facsimile: (703) 816-4100

**INFORMATION DISCLOSURE  
CITATION**

ATTY. DOCKET NO.

SERIAL NO.

620-370

10/535,226

APPLICANT

MOTTERLINI et al.

(Use several sheets if necessary)

FILING DATE

GROUP

May 17, 2005

1614

**U.S. PATENT DOCUMENTS**

*EXAMINER INITIAL	DOCUMENT NUMBER	DATE	NAME	CLASS	SUBCLASS	FILING DATE IF APPROPRIATE
	1	5,882,674	03/1999	Herrmann et al.		
	55	2002/0155166	10/2002	Choi et al		

**FOREIGN PATENT DOCUMENTS**

		DOCUMENT	DATE	COUNTRY	CLASS	SUBCLASS	TRANSLATION	
							YES	NO
	2	WO 98/48848	11/1998	WIPO				
	3	WO 91/01128	02/1991	WIPO				
	4	WO 91/01301	02/1991	WIPO				
	5	WO 98/29115	07/1998	WIPO				
	6	HU-B-211 084	10/1995	Hungary				
	7	WO 95/05814	03/1995	WIPO				
	8	WO 00/56743	09/2000	WIPO				

**OTHER DOCUMENTS (including Author, Title, Date, Pertinent pages, etc.)**

	9	Sjostrand T. Endogenous formation of carbon monoxide in man under normal and pathological conditions. Scan J Clin Lab Invest 1949;1:201-14.
	10	Coburn RF, Blakemore WS, Forster RE. Endogenous carbon monoxide production in man. J Clin Invest 1963;42:1172-8.
	11	Tenhunen R, Marver HS, Schmid R. Microsomal heme oxygenase. Characterization of the enzyme. J Biol Chem 1969;244:6388-94.
	12	Maines MD. Heme oxygenase: function, multiplicity, regulatory mechanisms, and clinical applications. FASEB J 1988;2:2557-68.
	13	Furchgott RF, Jothianandan D. Endothelium-dependent and -independent vasodilation involving cGMP: relaxation induced by nitric oxide, carbon monoxide and light. Blood Vessels 1991;28:52-61.
	14	Morita T, Perrella MA, Lee ME, Kourembanas S. Smooth muscle cell-derived carbon monoxide is a regulator of vascular cGMP. Proc Natl Acad Sci USA 1995;92:1475-9.
	15	Sammur IA, Foresti R, Clark JE, Exon DJ, Vesely MJ, Sarathchandra P, Green CJ, Motterlini R. Carbon monoxide is a major contributor to the regulation of vascular tone in aortas expressing high levels of haeme oxygenase-1. Br J Pharmacol 1998;125:1437-44.
	16	Maines MD. The heme oxygenase system: a regulator of second messenger gases. Annu Rev Pharmacol Toxicol 1997;37:517-54.
	17	Soares MP, Lin Y, Anrather J, Csizmadia E, Takigami K, Sato K, Grey ST, Colvin RP, Choi AM, Poss KD, et al. Expression of heme oxygenase-1 can determine cardiac xenograft survival. Nature Med 1998;4:1073-7.
	18	Willis D, Moore AR, Frederick R, Willoughby DA. Heme oxygenase: a novel target for the modulation of inflammatory response. Nature Med 1996;2:87-90.

\*Examiner

Date Considered

Examiner: Initial if reference considered, whether or not citation is in conformance with MPEP 609; Draw line through citation if not in conformance and not considered.  
Include copy of this form with next communication to application.

Form PTO-FB-A820 (Also PTO-1449)

**INFORMATION DISCLOSURE  
CITATION**

ATTY. DOCKET NO.

SERIAL NO.

620-370

10/535,226

APPLICANT

MOTTERLINI et al.

(Use several sheets if necessary)

FILING DATE

GROUP

May 17, 2005

1614

**FOREIGN PATENT DOCUMENTS**

	DOCUMENT	DATE	COUNTRY	CLASS	SUBCLASS	TRANSLATION	
						YES	NO
26	WO 02/080923	10/2002	WIPO				
27	WO 94/22482	10/1994	WIPO				

**OTHER DOCUMENTS (including Author, Title, Date, Pertinent pages, etc.)**

19	Motterlini R, Gonzales A, Foresti R, Clark JE, Green CJ, Winslow RM. Heme oxygenase-1-derived carbon monoxide contributes to the suppression of acute hypertensive responses <i>in vivo</i> . <i>Circ Res</i> 1998;83:568-77.
20	Otterbein LE, Mantell LL, Choi AMK. Carbon monoxide provides protection against hyperoxic lung injury. <i>Am J Physiol</i> 1999;276:L688-94.
21	Otterbein LE, Kolls JK, Mantell LL, Cook JL, Alam J, Choi AMK. Exogenous administration of heme oxygenase-1 by gene transfer provides protection against hyperoxia-induced lung injury. <i>J Clin Invest</i> 1999;103:1047-54.
22	Herrick RS, Brown TL. Flash photolytic investigation of photoinduced carbon monoxide dissociation from dinuclear manganese carbonyl compounds. <i>Inorg Chem</i> 1984;23:4550-3.
23	Alessio E, Milani B, Bolle M, Mestroni G, Falechini P, Todone F, Geremia S, Calligaris M. Carbonyl derivatives of chloride-dimethyl sulfoxide-ruthenium(II) complexes: synthesis, structural characterization, and reactivity of Ru(CO) <sub>x</sub> (DMSO) <sub>4-x</sub> Cl <sub>2</sub> complexes (x=1-3). <i>Inorg Chem</i> 1995;34:4722-34.
24	Sato K., Balla J., Otterbein L., Smith R.N., Brouard S., Lin Y., Csizmadia E., Sevigny J., Robson S.C., Vercellotti G., Choi A.M., Bach F.H., Soares M.P. Carbon monoxide generated by heme oxygenase-1 suppresses the rejection of mouse-to-rat cardiac transplants. <i>J. Immunol.</i> 166:4185-4194, 2001.
25	G. Pneumatikakis, A. Yannopoulos and J. Markopoulos, <i>Inorg. Chim. Acta</i> , 1988, 151, 243.
28	Motterlini R. et al., Carbon monoxide-releasing molecules: characterization of biomedical and vascular activities, <i>Circulation Research</i> . 2002, vol. 90, no. 2, E17-E24.
29	Yan Y.K. et al., Cytotoxicity of rhenium (I) alkoxo and hydroxo carbonyl complexes in murin and human tumor cells, <i>Pharmazie</i> (2000), 55(4), 307-313.
30	Becker M.J. et al., Age related changes in antibody dependent cell mediated cytotoxicity in mouse spleen, <i>Israel J. Medical Sciences</i> (1979), vol. 15, no. 2, 147-150.
31	Nagai M. et al., Unusual CO bonding geometry in abnormal subunits of hemoglobin M Boston and hemoglobin M Saskatoon, <i>Biochemistry</i> (1991), vol. 30, no. 26, 6495-6503.
32	Tomita A. et al., Structure and reaction of bis(L-cysteinato)dicarbonyliron(II), <i>Inorganic and Nuclear Chemistry Letters</i> (1968), 4(12), 715-18.
33	Ferrier, F.; Terzian, G.; Mossoyan, J.; Benlian, D, FTIR spectrometric study of geometrical isomers of dicarbonyl ferrobiscysteinate Influence of the counter cation. <i>Laboratoire de Chimie de Coordination, D22, Universite de Provence, Av. Escadrille Normandie-Niemen, Marseille, Fr.</i> <i>J. Mol. Struct.</i> (1995), 344(3), 189-93. CODEN: JMOSB4 ISSN: 0022-2860. Journal written in English. CAN 122:250765 AN 1995:414110 CAPLUS (Copyright 2002 ACS)
34	Szakacs-Schmidt, Aniko; Kreisz, Jozsef; Marko, Laszlo; Nagy-Magos, Zsuzsa; Takacs, Janos, Iron(II) thiolates as reversible carbon monoxide carriers, <i>Res. Inst. Chem. Eng., Hung. Acad. Sci., Veszprem, Hung.</i> <i>Inorg. Chim. Acta</i> (1992), 198-200 401-5. CODEN: ICHAA3 ISSN: 0020-1693. Journal written in English. CAN 117:263637 AN 1992:663637 CAPLUS (Copyright 2002 ACS)

\*Examiner

Date Considered

Examiner: Initial if reference considered, whether or not citation is in conformance with MPEP 609; Draw line through citation if not in conformance and not considered. Include copy of this form with next communication to application.

Form PTO-FB-A820 (Also PTO-1449)

**INFORMATION DISCLOSURE  
CITATION**

ATTY. DOCKET NO.

SERIAL NO.

620-370

10/535,226

APPLICANT

MOTTERLINI et al.

(Use several sheets if necessary)

FILING DATE

GROUP

May 17, 2005

1614

**U.S. PATENT DOCUMENTS**

*EXAMINER INITIAL	DOCUMENT NUMBER	DATE	NAME	CLASS	SUBCLASS	FILING DATE IF APPROPRIATE
	43	WO 02/092075	11/2002	WIPO		
	51	WO 01/16359	03/2001	WIPO		
	54	WO 02/078684	10/2002	WIPO		

**OTHER DOCUMENTS (including Author, Title, Date, Pertinent pages, etc.)**

35	Takacs, Janos; Soos, Erika; Nagy-Magos, Zsuzsa; Marko, Laszlo; Gervasio, Giuliana; Hoffmann, Thomas, Synthesis and molecular structure of carbonyl derivatives of iron(II) thiolates containing nitrogen-donor ligands, Res. Group Petrochem., Hung. Acad. Sci., Veszprem, Hung. Inorg. Chim. Acta (1989), 166(1), 39-46. CODEN: ICHAA3 ISSN: 0020-1693. Journal written in English. CAN 113:16859 AN 1990:416859 CAPLUS (Copyright 2002 ACS)
36	Carroll, James A.; Fisher, David R.; Rayner-Canham, Geoffrey W.; Sutton, Derek, Ligand abstraction in the reaction of aryldiazonium ions with some iron complexes containing coordinated cysteine, maleonitriledithiol, or triarylphosphine, Dep. Chem., Simon Fraser Univ., Burnaby, B. C., Can. Can. J. Chem. (1974), 52(10), 1914-22. CODEN: CJCHAG Journal written in English. CAN 81:32728 AN 1974:432728 CAPLUS (Copyright 2002 ACS)
37	M.P. Schubert, The action of carbon monoxide on iron and cobalt complexes of cysteine, J. Am. Chem. Soc., 1933, 55, 4564-4570.D54
38	Y. Huang, M.C. Marden, J.C. Lambry, M.P., Photolysis of the histidine-heme-carbon monoxide complex, Fontaine-Aupart, R. Pansu, J.L. Martin and C. Poyart, J. Am. Chem. Soc., 1991, 113, 9141.
39	J. Silver and B. Lukas, Moessbauer studies on protoporphyrin IX iron (II) solutions containing sulfur ligands and their carbonyl adducts. Models for the active site of cytochromes P-450, Inorg. Chim. Acta, 1984, 91, 279.
40	C.M. Wang and W.S., A correlation of the visible and Soret spectra of dioxygen- and carbon monoxide-heme complexes and five-coordinate heme complexes with the spectra of oxy-, carboxy-, and deoxyhemoglobins, Brinigar, Biochemistry, 1979, 18, 4960.
41	A.A. Diamantis and J.V. Dubrawski, Preparation and structure of ethylenediaminetetraacetate complexes and other $\pi$ -acceptor ligands, Inorganic Chemistry (1981), 20(4), 1142-1150.
42	R. Urban et. al., "Metal complexes of biologically important ligands, LXXXVII alpha-amino carboxylate complexes of palladium(II), iridium(III) and ruthenium(II) from chloro-bridged ortho-metallated metal compounds and [(OC)3Ru(Cl)( $\mu$ -CL)]2, Organomet. Chem. 1996, 517 191
44	Friebe A, Mullershausen F, Smolenski A, Walter U, Schultz G and Koesling D. YC-1 potentiates nitric oxide- and carbon monoxide-induced cyclic GMP effects in human platelets. Mol Pharmacol 54: 962-967, 1998
45	Friebe A, Schultz G and Koesling D. Sensitizing soluble guanylyl cyclase to become a highly CO-sensitive enzyme. Embo J 15: 6863-6868, 1996
46	Furchgott RF and Jothianandan D. Endothelium-dependent and -independent vasodilation involving cGMP: relaxation induced by nitric oxide, carbon monoxide and light. Blood Vessels 28: 52-61, 1991

\*Examiner

Date Considered

Examiner: Initial if reference considered, whether or not citation is in conformance with MPEP 609; Draw line through citation if not in conformance and not considered. Include copy of this form with next communication to application.

Form PTO-FB-A820 (Also PTO-1449)

**INFORMATION DISCLOSURE  
CITATION**

(Use several sheets if necessary)

ATTY. DOCKET NO.

620-370

APPLICANT

MOTTERLINI et al.

FILING DATE

May 17, 2005

SERIAL NO.

10/535,226

GROUP

1614

**U.S. PATENT DOCUMENTS**

*EXAMINER INITIAL	DOCUMENT NUMBER	DATE	NAME	CLASS	SUBCLASS	FILING DATE IF APPROPRIATE

**OTHER DOCUMENTS (including Author, Title, Date, Pertinent pages, etc.)**

47	Moncada S, Palmer RMJ and Higgs EA. Nitric oxide: physiology, pathophysiology, and pharmacology. Pharmacol Rev 43: 109-142, 1991.
48	Motterlini R, Clark JE, Foresti R, Sarathchandra P, Mann BE and Green CJ. Carbon monoxide-releasing molecules: characterization of biochemical and vascular activities. Circ Res 90: E17-E24, 2002.
49	Stone JR and Marletta MA. Soluble guanylate cyclase from bovine lung: activation with nitric oxide and carbon monoxide and spectral characterization of the ferrous states. Biochemistry 33: 5636-5640, 1994.
50	Becker EM et al. NO-independent regulatory site of direct sGC stimulators like YC-1 and BAY 41-2272. BMC Pharmacology 1: 13, 2001.
52	Kharitonov, V. G. et al.; "Kinetics and Equilibria of Soluble Guanylate Cyclase Ligation by CO: Effect of YC-1"; Biochemistry; 1999; 38; 10699-706
53	MEDLINE abstract, Diabetes, 2002, 51(4), 994-999

*Examiner	Date Considered
-----------	-----------------

Examiner: Initial if reference considered, whether or not citation is in conformance with MPEP 609; Draw line through citation if not in conformance and not considered. Include copy of this form with next communication to application.

Form PTO-FB-A820 (Also PTO-1449)